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ABSTRACT

The purpose of this study was to compare students' perceptions of teacher-student interactions with those of their teachers by administering the Questionnaire on Teacher Interaction (QTI) to teachers and students in 80 lower secondary school classes in Tasmania and Western Australia. There are three possible versions of the QTI. Students completed the student version which assesses the students' perceptions of the teacher-student interaction in a specific class. Their teachers completed the teacher actual version of how they perceived their interactions with their students in those same classes. The teachers also indicated how they thought ideal teachers would interact with students by responding to the teacher ideal version. Previous statistical analysis had confirmed the reliability and validity of the QTI for secondary school students. Two multilevel models were proposed: the teacher ideal interaction influences the teacher actual interaction; and the teacher actual affects the student actual and vice versa. Using structural equation modeling techniques, both models were found to be reasonable fits to the data. The results would seem to confirm the underlying basis of the QTI in that the teachers' actual perceptions of their interactions with students affects the students' perceptions, which in turn affect the teachers' perceptions. (Contains 26 references, 6 tables, and 2 figures.) (Author/PM)

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A MULTI-LEVEL MODEL OF CLASSROOM INTERACTIONS USING TEACHER AND STUDENT PERCEPTIONS

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A MULTI-LEVEL MODEL OF CLASSROOM INTERACTIONS USING TEACHER AND STUDENT PERCEPTIONS

Abstract

The purpose of the study was to compare students' perceptions of teacher-student interactions with those of their teachers by administering the Questionnaire on Teacher Interaction (QTI) to teachers and students in 80 lower secondary classes in schools in Tasmania and Western Australia. There are three possible versions of the QTI. Students completed the student version which assesses the students' perceptions of the teacher-student interactions in a specific class. Their teachers completed the teacher actual version of how they perceived their interactions with their students in those same classes. The teachers also indicated how they thought ideal teachers would interact with students by responding to the teacher ideal version. Previous statistical analysis had confirmed the reliability and validity of the QTI for secondary school students. Two multilevel models were proposed: the teacher ideal interaction influences the teacher actual interaction; and the teacher actual affects the student actual and vice versa. Using structural equation modelling techniques, both models were found to be reasonable fits to the data. The results would seem to confirm the underlying basis of the QTI in that the teachers' actual perceptions of their interactions with students affects the students' perceptions, which in turn affect the teachers' perceptions.

Background

Teacher and Student Interaction in the Classroom

International research efforts over the last 25 years have firmly established classroom environment as a thriving field of study (Fraser, 1994; Fraser & Walberg, 1991). Recent classroom environment research has focused on constructivist classroom environments (Taylor, Fraser, & Fisher, 1997), cross-national studies of science classroom environments (Fisher, Rickards, Goh, & Wong, 1997), science laboratory classroom environments (McRobbie & Fraser, 1993), computer laboratory classroom environment (Newby & Fisher, 2000), computer-assisted instruction classrooms (Fisher & Stolarchuk, 1997; Teh & Fraser, 1995) and the teacher-student interactions that occur in the classroom (Wubbels & Levy, 1993).

Learning environment research on teacher-student interaction began in The Netherlands where Wubbels, Créton, and Hooymayers (1985) developed a model to map teacher-student interactions extrapolated from the work of Leary (1957). This model was used in the development of an instrument, the *Questionnaire on Teacher Interaction* (QTI), to gather students' and teachers' perceptions of teacher-student interactions (Wubbels, Brekelmans, & Hooymayers, 1991; Wubbels & Levy, 1993). This model maps these interactions with the aid of an *influence* dimension (Dominance, D – Submission, S) and a *proximity* dimension (Cooperation, C – Opposition, O). These dimensions are represented in a coordinate system divided into eight equal sectors.

Every instance of interactional teacher behaviour can be placed within this system of axes. The closer the instances of behaviour are in the chart, the more closely they resemble each other. The sections are labelled DC, CD, CS, SC, SO, OS, OD and DO according to their position in the coordinate system. For example, the two sectors DC and CD are both characterised by Dominance and Cooperation. In the DC sector, however, the Dominance aspect prevails over the

Cooperation aspect, whereas in the adjacent sector CD Cooperation prevails over the Dominance aspect (Wubbels, Créton, Levy, & Hooymayers, 1993). Table 1 shows the names of the behaviours (e.g., leadership behaviour, helping/friendly behaviour, understanding behaviour) given to each sector. These sector names are the names given to the eight scales of the QTI. Table 1 clarifies further the nature of the QTI by providing a scale description and a sample item for each of the eight scales.

The information obtained by means of the questionnaire includes perceptions of the behaviour of the teacher towards the students as a class, and reflects relatively stable patterns of behaviour over a considerable period. One advantage of the QTI is that it can be used to obtain the perceptions of interpersonal behaviour of either students or teachers. When the QTI is administered to both teachers and their students, information is provided about the perceptions of teachers and the perceptions of their students of the teacher-student interactions occurring in the classroom of that teacher. The wording of the questionnaire is varied slightly when used to obtain teachers' self-perceptions. For example the question "This teacher talks enthusiastically about his/her subject", becomes "I talk enthusiastically about my subject" in the teacher self-perception version, and "This teacher would talk enthusiastically about his/her subject" in the teacher ideal version.

Table 1: *Description of Scales and Sample Items for each Scale of the QTI*

Scale Name	Description of Scale (The extent to which the teacher...)	Sample Item
Leadership	...leads, organises, gives orders, determines procedure & structures the classroom situation.	This teacher talks enthusiastically about his/her subject.
Helping/Friendly	...shows interest, behaves in a friendly or considerate manner & inspires confidence and trust.	This teacher helps us with our work.
Understanding	...listens with interest, empathises, shows confidence and understanding & is open with students.	This teacher trusts us.
Student Responsibility/Freedom	...gives opportunity for independent work, gives freedom and responsibility to students.	We can decide some things in this teacher's class.
Uncertain	...behaves in an uncertain manner & keeps a low profile.	This teacher seems uncertain.

Dissatisfied	...expresses dissatisfaction, looks unhappy, criticises & waits for silence.	This teacher thinks that we cheat.
Admonishing	...gets angry, express irritation and anger, forbids & punishes.	This teacher gets angry unexpectedly.
Strict	...checks, maintains silence & strictly enforces the rules.	This teacher is strict.

Previous Use of the QTI

The QTI has been shown to be a valid and reliable instrument when used in The Netherlands (Wubbels & Levy, 1993). When the 64-item USA version of the QTI was used with 1,606 students and 66 teachers in the USA, the cross-cultural validity and usefulness of the QTI were confirmed. Using the Cronbach alpha coefficient, Wubbels and Levy (1991) reported acceptable internal consistency reliabilities for the QTI scales ranging from .76 to .84 for student responses and from .74 to .84 for teacher responses.

Another use of the QTI in The Netherlands involved investigation of relationships between perceptions on the QTI scales and student learning outcomes (Wubbels, Brekelmans, & Hooymayers, 1991). Regarding students' cognitive outcomes, the more that teachers demonstrated strict, leadership and helpful/friendly behaviour, then the higher were cognitive outcomes scores. Conversely, student responsibility and freedom, uncertain and dissatisfied behaviours were related negatively to achievement.

When teachers described their perceptions of their own behaviours, they tended to see it a little more favourably than did their students. On average, the teachers' perceptions were between the students' perceptions of actual behaviour and the teachers' ideal behaviour. An interpretation of this is that teachers think that they behave closer to their ideal than their students think they do.

Variations in the students' attitudes toward the subject and the lessons have been characterised on the basis of the proximity dimension: the more cooperative the behaviour displayed, the higher the affective outcome scores (Wubbels, Brekelmans, & Hooymayers, 1991). That is, student responsibility and freedom, understanding, helping/friendly and leadership behaviours were related positively to student attitudes. Uncertain, dissatisfied, admonishing and strict behaviours were related negatively to student attitudes. Overall, previous studies have indicated that interpersonal teacher behaviour is an important aspect of the learning environment and that it is related strongly to student outcomes.

Levy, Créton, and Wubbels (1993) analysed data from studies in The Netherlands, the USA and Australia involving students being asked to use the QTI to rate their best and worst teachers. Students rated their best teachers as being strong leaders and as friendly and understanding. The characteristics of the worst teachers were that they were more admonishing and dissatisfied.

Levy, Wubbels, Brekelmans, and Morganfield (1997) investigated a sample of 550 high school students in 38 classes comprised of three primary investigation groups, namely 117 Latinos, 111 Asians and 322 from the United States. The primary focus was the language and cultural factors

in students' perceptions of teacher communication style. This study focused on identifying ways in which the students' culture relates to student perceptions of their teachers. The results from this study suggested that the students' cultural background is indeed significantly related to the perceptions that they had of their teachers' interaction behaviour. The study also concluded that teachers do not seem to be aware of cultural differences in their interactions with students in their classes in the same way as their students were, despite altering their behaviour in classes with different cultural compositions.

The Australian version of the QTI containing 48 items was used in a pilot study involving upper secondary science classes in Western Australia and Tasmania (Fisher, Fraser, & Wubbels, 1993; Fisher, Fraser, Wubbels, & Brekelmans, 1993; Fisher, Henderson, & Fraser, 1995). This pilot study strongly supported the validity and potential usefulness of the QTI within the Australian context, and suggested the desirability of conducting further and more comprehensive research involving the QTI.

Wubbels (1993) used the QTI with a sample of 792 students and 46 teachers in Western Australia and Tasmania. The results of this study were similar to previous Dutch and American research in that, generally, teachers did not reach their ideal and differed from the best teachers as perceived by students. It is noteworthy that the best teachers, according to students, are stronger leaders, more friendly and understanding, and less uncertain, dissatisfied and admonishing than teachers on average. When teachers described their perceptions of their own behaviours, they tended to see it a little more favourably than did their students. On average, the teachers' perceptions were between the students' perceptions of actual behaviour and the teachers' ideal behaviour. An interpretation of this is that teachers think that they behave closer to their ideal than their students think that they do.

Methodology

The instruments were administered to science classes at the lower secondary levels in schools in two Australian states, namely, Tasmania and Western Australia. The total sample involved 1,659 students in 80 science classes spread approximately equally between grades 8, 9 and 10 in 16 different schools. Each student in the sample responded to the student version of the QTI while their 164 teachers completed the teacher self and teacher ideal versions. In the analysis, the students' perception of the teacher interaction was measured by using the class mean as the unit. Two structural equation models were proposed in order to investigate possible relationships between a teacher's perception of their ideal and actual interaction, and relationships between a teacher's perception of the actual interaction and the class's perception of that interaction.

Results

Reliability of the Questionnaire

Table 2 provides the alpha reliability coefficients for all three versions of the QTI when used with the present sample of science classes. Since this study focused on the perceptions of the class as a whole, the coefficient for the student version of the QTI is based on the class mean score. For the teacher ideal version, the alpha reliabilities varied from 0.62 to 0.86, for the teacher self version they varied from 0.72 to 0.92, and for the student version using the class mean as the unit of analysis, from 0.78 to 0.96. These values provide further information supporting the internal consistency of the scales of all versions of QTI.

Table 2: *Internal Consistency (Cronbach Alpha Coefficient) for different versions of the QTI*

Scale	Teacher-Actual	Teacher-Ideal	Student-Class Mean
Leadership	.88	.81	.93
Helping/Friendly	.92	.86	.96
Understanding	.88	.83	.95
Student Resp/ Freedom	.79	.65	.82
Uncertain	.78	.69	.87
Dissatisfied	.84	.78	.93
Admonishing	.79	.75	.87
Strict	.72	.62	.78

n = 1659 students and 72 teachers in 80 classes.

Proposed Model of Relationship between Teacher Ideal and Teacher Actual Interaction

A structural equation model was proposed for the relationship between the teacher ideal and teacher actual interactions. This model without the errors and disturbances is shown in Figure 1. In it there are two latent variables Teacher-ideal and Teacher-actual. The latent variable Teacher-ideal affects the responses to the questions relating to the scales of the Teacher Ideal version of the QTI and the variable Teacher-actual the responses to the questions relating to the scales of the Teacher Actual version of the QTI. Further, it is hypothesised that there is a causal relationship between Teacher_ideal and Teacher_actual.

Analysis of the Model of Teacher Ideal and Teacher Actual

The data were run with Amos 4, and the model converged in 8 iterations. A summary of the results is shown in Table 3 where it may be seen that all regression coefficients are significant ($p<0.05$) except for those between the observed variables Student Responsibility and Admonishing and their corresponding latent variable, whether ideal or actual.

There are many indices for measuring how well a model fits the data (Marcoulides & Hershberger, 1997; Schumaker & Lomax, 1996) and the ones given in Tables 4 and 6 are the χ^2 degrees of freedom ratio (χ^2/ df), the Goodness of Fit Index (GFI), the Adjusted Goodness of Fit Index (AGFI), the Root Mean Square Residual (RMR), and the Root Mean Square of the Error of the Approximation (RMSEA). The ratio χ^2/ df is a frequently used measure, and a value of less than 2 is considered to show a very good fit. The GFI measures the relative amount of variance and covariance in the data accounted for by the proposed model. Values in excess of 0.90 are considered to indicate a good fit. The AGFI makes allowance for the complexity of the model and again a figure above 0.90 is considered a good fit. The RMR measures the amount of remaining variance not explained by the model and in figure of 0.05 indicates a good fit. The RMSEA is a measure of the discrepancy of the fitted model per degree of freedom, and a value of 0.05 shows a close fit with a value of 0.08 representing reasonable errors (Jöreskog, 1993).

Table 4 contains the values of these indices for this model. Although all of them are outside the acceptable limits, most are just outside so this would indicate that the model is a reasonable if not a good fit.

Table 3: *Regression Coefficients for the Model of Teacher_Ideal – Teacher_Actual*

Relationship	B	β
Teacher_Actual ← Teacher_Ideal	4.45	0.85**
Leadership_Ideal ← Teacher_Ideal	0.80	0.28*
Helping_Ideal ← Teacher_Ideal	1.00	0.87#
Understanding_Ideal ← Teacher_Ideal	0.76	0.86**
Student_Resp_Ideal ← Teacher_Ideal	0.00	0.00
Uncertain_Ideal ← Teacher_Ideal	-0.74	-0.27*
Dissatisfied_Ideal ← Teacher_Ideal	-0.85	-0.60**
Admonishing_Ideal ← Teacher_Ideal	-0.05	-0.04
Strict_Ideal ← Teacher_Ideal	-0.97	-0.72**
Leadership_Actual ← Teacher_Actual	0.10	0.54**
Helping_Actual ← Teacher_Actual	0.18	0.88**
Understanding_Actual ← Teacher_Actual	0.16	0.75**
Student_Resp_Actual ← Teacher_Actual	-0.03	-0.06
Uncertain_Actual ← Teacher_Actual	-0.14	-0.53**
Dissatisfied_Actual ← Teacher_Actual	-0.15	-0.55**
Admonishing_Actual ← Teacher_Actual	0.03	-0.02
Strict_Actual ← Teacher_Actual	-0.19	-0.60**

#used for identification, $^{**}p < .01$, $^{*}p < .05$

Table 4: *Fit Coefficients for the Model of Teacher_Ideal - Teacher_Actual*

Coefficient	Value
χ^2	292.58
df	106
χ^2/df	2.761
GFI	0.853
AGFI	0.791
RMR	0.127
RMSEA	0.083

Proposed Model of Relationship between Teacher Actual and Student Actual Interaction

A structural equation model was proposed for the relationship between the teacher actual and student actual interactions. This model without the errors and disturbances is shown in Figure 2. In it there are two latent variables Teacher_actual and Student_actual. The latent variable Teacher_actual affects the responses to the questions relating to the scales of the Teacher Actual version of the QTI and the variable Student_actual the responses to the questions relating to the scales of the Student Actual version of the QTI. Further, it is hypothesised that there is a causal relationship between Teacher_actual and Student_actual, and also in the reverse direction, Student_actual and Teacher_actual.

Analysis of the Model of Teacher Actual and Student Actual

The data were run with Amos 4, and the model converged in 10 iterations. A summary of the results is shown in Tables 5 where it may be seen that all regression coefficients are significant ($p<0.05$) except for those between the observed variables Student Responsibility and Admonishing and their corresponding latent variable, whether Teacher_actual or Student_actual. Table 6 contains the values of the fit indices for this model. As with the previous model, all of them are outside the acceptable limits, but most are just outside so this would indicate that the model is a reasonable if not a good fit.

Table 5: *Regression Coefficients for the Model of Teacher_Actual – Student_Actual*

Relationship	B	β
Teacher_Actual ← Student_Actual	0.52	0.26*
Student_Actual ← Teacher_Actual	3.75	0.72**
Leadership_Actual ← Teacher_Actual	0.10	0.54**
Helping_Actual ← Teacher_Actual	0.18	0.88**
Understanding_Actual ← Teacher_Actual	0.16	0.75**
Student_Resp_Actual ← Teacher_Actual	-0.03	-0.06
Uncertain_Actual ← Teacher_Actual	-0.14	-0.53**
Dissatisfied_Actual ← Teacher_Actual	-0.15	-0.55**
Admonishing_Actual ← Teacher_Actual	0.03	-0.02
Strict_Actual ← Teacher_Actual	-0.19	-0.60**
Leadership_Student ← Student_Actual	0.82	0.52**
Helping_Student ← Student_Actual	1.00	0.87#
Understanding_Student ← Student_Actual	0.74	0.80**
Student_Resp_Student ← Student_Actual	0.00	0.00
Uncertain_Student ← Student_Actual	-0.94	-0.54**
Dissatisfied_Student ← Student_Actual	-0.84	-0.65**
Admonishing_Student ← Student_Actual	-0.03	-0.02
Strict_Student ← Student_Actual	-0.92	-0.70**

used for identification, ** $p < .01$

Table 6: *Fit Coefficients for the Model of Teacher_Actual - Student_Actual*

Coefficient	Value
χ^2	301.45
Df	104
χ^2/df	2.899
GFI	0.843
AGFI	0.782
RMR	0.115
RMSEA	0.087

Discussion

The fit indices indicate that both models are reasonable if not good fits to the data. One observation that must be made is that in both models the regression coefficients for the observed variables Student Responsibilty/Freedom (Submission-Cooperation) and Admonishing (Opposition-Dominance) on the corresponding latent variable (Teacher_Ideal, Teacher_Actual, Stuednt_Actual) are not significant. In fact, the regression coefficient is either zero or close to it in most cases. This would suggest that these observed variables are not factors that contribute to the classroom interaction. Of the other observed variables, the coefficients for Leadership, Helping/Friendly, Understanding contribute positively and Uncertain, Dissatisfied, Strict contribute negatively. These results are in line with expectations so would tend to confirm these scales as contributing to the measurement of classroom interaction.

The first model shows that the standardised regression coefficient of Teacher_Ideal on Teacher_Actual is 0.85 indicating a comparatively large effect of the teacher's ideal interaction with what they perceive to be the actual interaction. The second model shows that the standardised regression coefficient of Teacher_Actual on Student_Actual is 0.72, and that of Student_Actual on Teacher_Actual is 0.26. Both are sugnificant. These results demonstrate that the teacher's perception of the interaction affects the class's perception, and that the class's perception also affects the teacher's perception but to a lesser degree.

Conclusion

During the development of the QTI in The Netherlands, Wubbels, Creton, and Holvast (1988) indicated a desire to investigate teacher behaviour in classrooms from a systems perspective, adapting a theory on communication processes developed by Watzlawick, Beavin, and Jackson (1967). Within this systems perspective on communication, it is assumed that the behaviours of participants influence each other mutually. The behaviour of the teacher is influenced by the behaviour of the students and in turn influences student behaviour. Circular communication processes develop which not only consist of behaviour, but determine behaviour as well. This study has confirmed that the assumption underlying the use of the QTI in classrooms is correct and that the teacher's perception of the actual classroom interaction does influence how the students perceive the classroom interaction, and this in turn influences the teacher's perceptions.

The significance of this study is that it is one of the first that proposes a multi-level model of classroom interaction. It demonstrates that the way a teacher perceives an ideal classroom interaction should be influences the teacher's perception of the actual classroom interaction. Also, the teacher's perception of the actual classroom interaction influences how the students perceive the classroom interaction, and vice versa. It is this that highlights the potential usefulness of the QTI as a tool for self reflection (Rickards & Fisher, 2000). If teachers modify the way in which they interact with students in response to students' perceptions of the classroom interaction then this should have a positive effect on those perceptions which in turn should affect the teacher's perception of the classroom interaction.

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Figure 1: Model of Teacher_Ideal - Teacher_Actual Interations

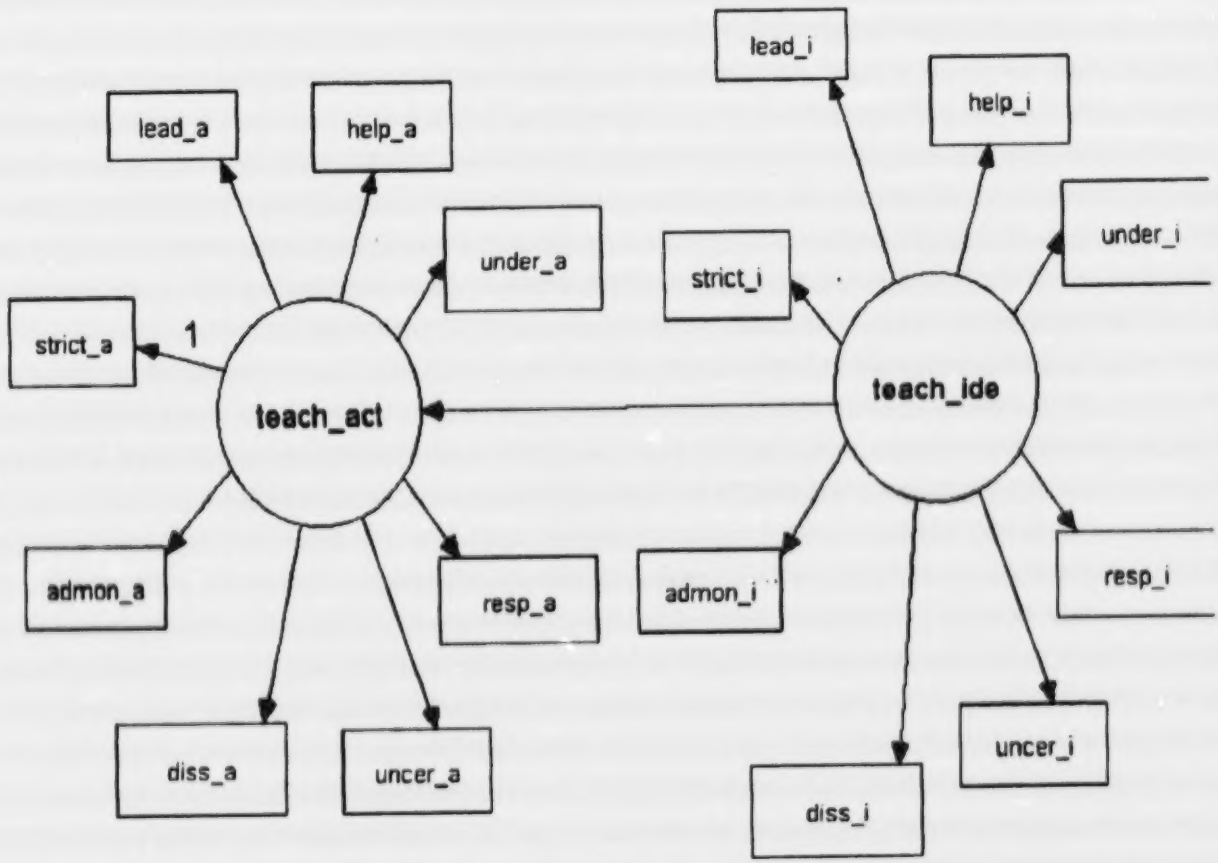

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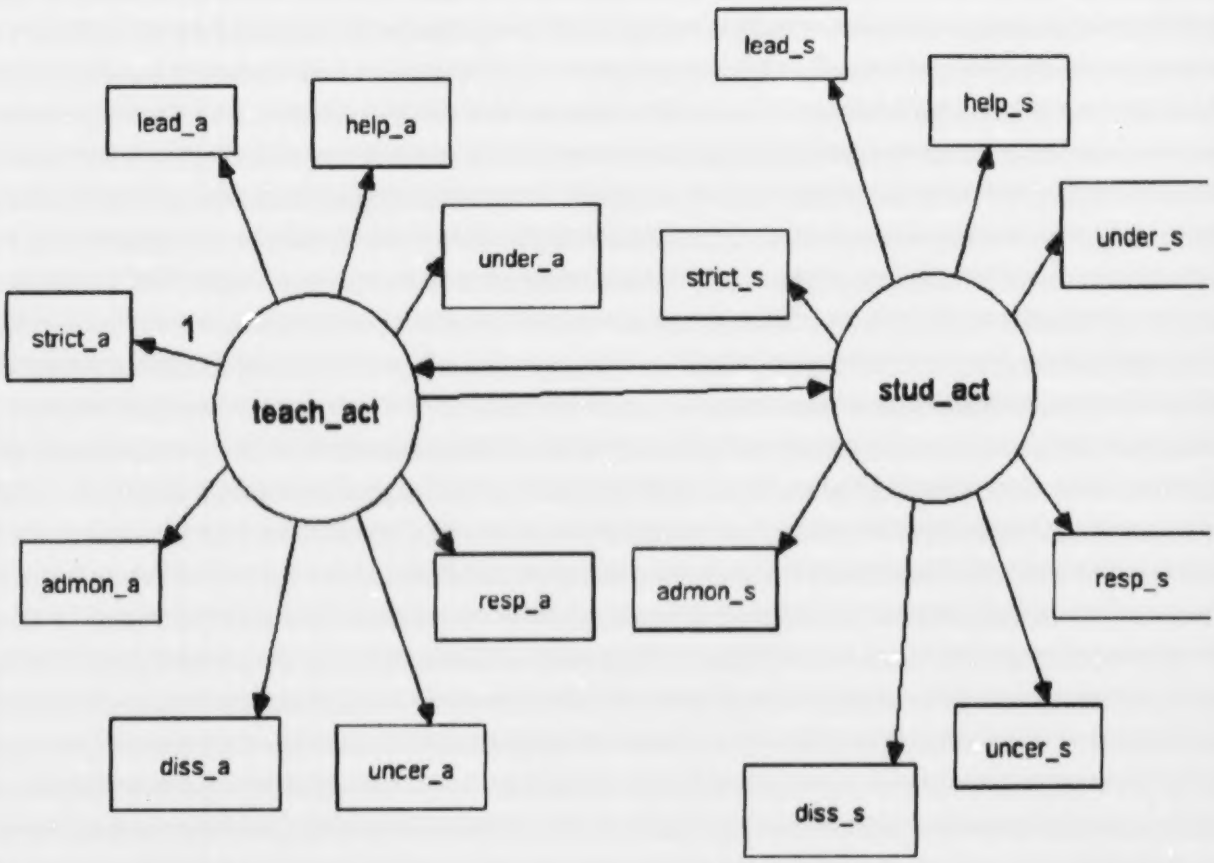
Figure 2: Model of Teacher_Actual - Student_Actual



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